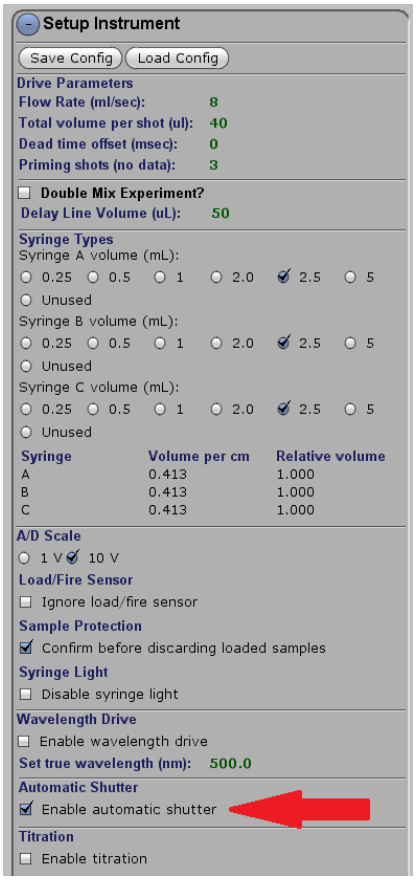
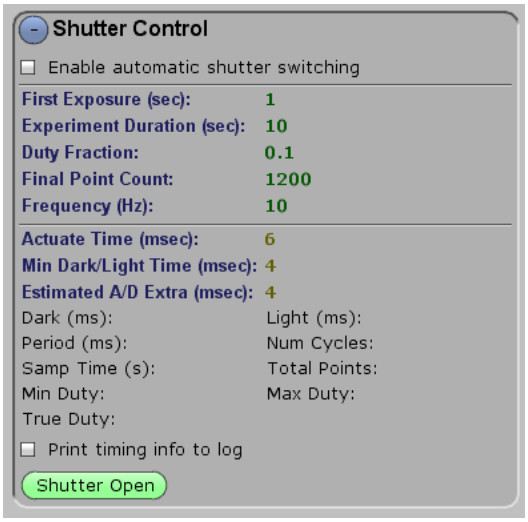
Light Source Shutter Control addendum

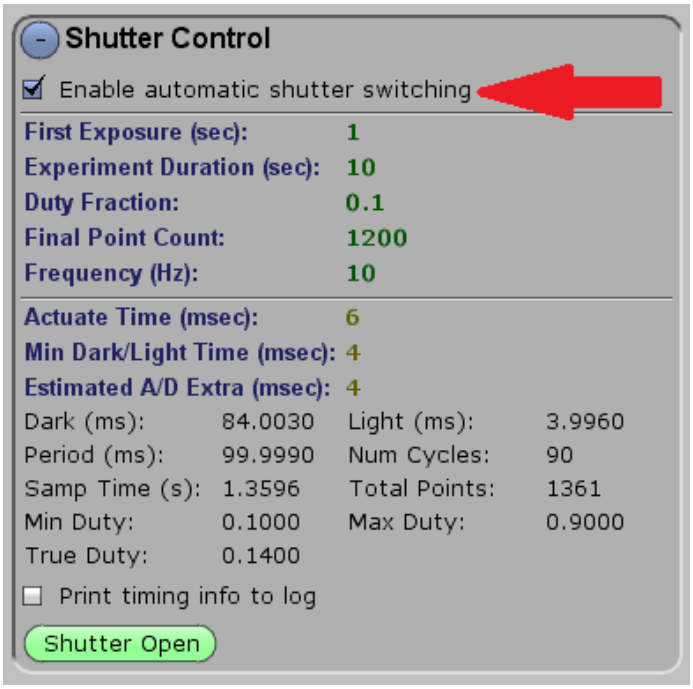
In order to enable the automatic shutter option, first check the box in “Setup Instrument” labeled “Enable automatic shutter”.



After restarting the software, this will activate the “Shutter Control” section of the software. Simply enabling the automatic shutter will automate shutter control for tasks such as dark current and reference readings.



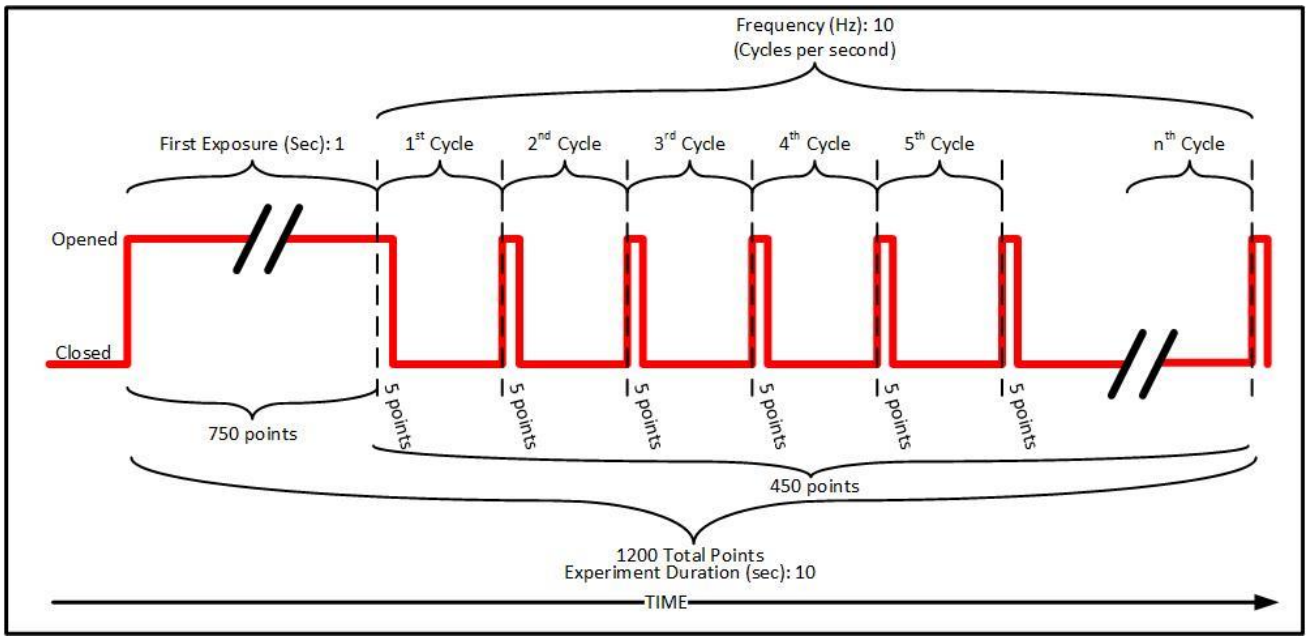
Enabling automatic shutter switching will activate the shutter during data collection mode.



This mode will allow for an initial exposure of your sample, then subsequent exposures based on a user defined “Duty Fraction”.

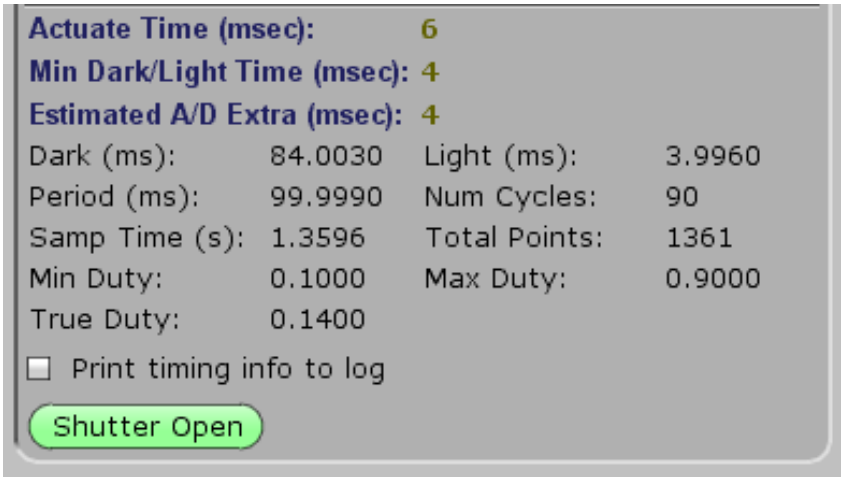
During automatic shutter switching the following user defined variables are used:

1. First Exposure (sec): This is the initial exposure that your sample will be exposed to and data will be collected for the duration of this time without interruption.
2. Experiment Duration (sec): This is the entire amount of time for the experiment including the initial exposure and all individual periods following this exposure.
3. Duty Fraction: This is the fraction of each period during which the sample will be exposed and the system will be collecting data. Theoretically, this value could range from 0 to 1 but given the mechanical or electrical limitations of the system, the full range of the duty fraction is 0.1 (1/10) to 0.9 (9/10).
4. Final Point Count: This value is the "target" point count for the experiment. Slightly more points may be collected in each experiment because of the "Actuate Time" and "True Duty".
5. Frequency (Hz): This is the number of times in 1 second that the shutter will open and close.



This diagram outlines each of these variables in the example shown above.

In addition to the above defined variables, there are 3 others that are set up based on the hardware being used:



1. Actuate Time (msec): This defines the amount of time it takes for the electromechanical system to open a shutter or turn on a light source (LED). This value may be slightly different for each shutter or LED.
2. Min Dark/Light Time (msec): This defines the amount of time that it takes for the system to go from dark to full intensity.
3. Estimated A/D Extra (msec): This is an extra variable that simply shifts the data collection window to account for the shift in time caused by the actuation time.
4. Checkbox: “Print timing info to log”: Check this box to print precise timing information for collection and switching to a log file for evaluation or troubleshooting.
5. Button “Shutter Open”: Click this control to change it to “Shutter Closed” and change the state of the light source (LED) or shutter.

The other values shown are calculated based on the user input:

1. Dark(ms): The amount of time during each cycle that the system is truly dark.
2. Period(ms): The calculated period for the given variables.
3. Sample Time (s): The total amount of time that the sample is exposed (including initial exposure.)
4. Min Duty: The minimum fraction of time that the sample can be exposed.
5. True Duty: The actual span of time that it takes from one closed/dark state to another.
6. Light (ms): The amount of time per cycle that the sample is exposed.
7. Num Cycles: The total number of light/dark cycles in the experiment.
8. Total Points: The total number of points recorded during the experiment.
9. Max Duty: The maximum fraction of time the sample can be exposed.